Impact of personality and psychological distress on health-related quality of life in kidney transplant recipients

Prihodova, Lucia; Nagyova, Iveta; Rosenberger, Jaroslav; Roland, Robert; van Dijk, Jitse P.; Groothoff, Johan W.

Published in:
Transplant International

DOI:
10.1111/j.1432-2277.2009.01003.x

Transplant International

Transplant International ISSN 0934-0874

ORIGINAL ARTICLE

Impact of personality and psychological distress on health-related quality of life in kidney transplant recipients

Lucia Prihodova,[1,2] Iveta Nagyova,[1] Jaroslav Rosenberger,[1,2,3,4] Robert Roland,[2,3] Jitse P. van Dijk[1,5,6] and Johan W. Groothoff[6]

1 Kosice Institute for Society and Health, Medical Faculty, PJ Safarik University Kosice, Kosice, Slovak Republic
2 Nephrology and Dialysis Center Fresenius Kosice, Kosice, Slovak Republic
3 Transplantation Department, University Hospital L. Pasteur Kosice, Kosice, Slovak Republic
4 1st Internal Clinic, Faculty of Medicine, PJ Safarik University Kosice, Kosice, Slovak Republic
5 Graduate School, Faculty of Medicine, PJ Safarik University Kosice, Kosice, Slovak Republic
6 Department of Social Medicine, University Medical Center Groningen, University of Groningen, Groningen, The Netherlands

Keywords
health-related quality of life, kidney transplantation, personality, psychological distress.

Correspondence
Lucia Prihodova MSc, Department of Educational Psychology and Health Psychology, Kosice Institute for Society and Health, Faculty of Arts, PJ Safarik University in Kosice, University Centre of Excellence, Moyzesova 16, 040 01 Kosice, Slovak Republic. Tel.: ++421 905 968 370; fax: ++421 55 622 21 24; e-mail: luciaprihodova@gmail.com

Received: 8 June 2009
Revision requested: 30 June 2009
Accepted: 20 October 2009
Published online: 19 November 2009

doi:10.1111/j.1432-2277.2009.01003.x

Summary

Health-related quality of life (HRQoL) has become an important outcome in the evaluation of kidney transplantation (KT). Although the medical and socio-demographic predictors of HRQoL in patients after KT are well known, there is still a lack of knowledge about the psychological factors involved. This study focuses on the role of personality and actual psychological distress in predicting HRQoL after KT. Sociodemographic (gender, age, education, average income), medical (glomerular filtration, serum albumin, number of co-morbid diseases) and psychological data (neuroticism, extroversion, psychological distress) were collected from 177 (60.5% male subjects; 48 ± 12.1 years) kidney transplant recipients, and physical and mental HRQoL were measured using the SF-36. A univariate general linear model analysis was performed. Higher physical HRQoL was associated with younger age, higher education and income, a low number of co-morbid diseases, lower neuroticism and distress. Higher mental HRQoL was associated with higher education and income, longer time from KT, higher extroversion, lower neuroticism and distress. In both physical and mental HRQoL, actual distress was the best predictor, even when controlled for neuroticism. These results confirm the importance of psychological distress in patients and its impact on their HRQoL after KT and can be applied in intervention programs focused on increasing HRQoL.

Introduction

Kidney transplantation (KT), because of its proven superior effect on survival, morbidity and costs in comparison with other renal replacement therapies [1,2] has become the most preferable renal replacement therapy for patients with end-stage renal disease. Recently, the effect of KT on health-related quality of life (HRQoL) – that is, on a patient's own evaluation of his or her quality of life related to general health after KT [3–5] – has been the center of much attention.

Health-related quality of life is generally understood to be a part of the overall concept of quality of life related to a person's health. It consists of the physical, psychological and social domains of health and can be measured in objective dimensions (a patient's degree of health) and subjective dimensions (perceptions and currently experienced quality of life). Previous research has shown an improvement in HRQoL after KT, and this has been found to be better than in patients on dialysis though not as good as in the general population, although the extent of improvement varies [4,6,7]. This variability can be

explained particularly by the factors that affect HRQoL after KT, among which sociodemographic and medical variables are those most often investigated. Only a small number of studies have considered the role of psychosocial variables in this process. On the other hand, many studies have confirmed the importance of negative affect, personality traits and distress in symptom perception and HRQoL estimation in different disease groups [8–14]. Enlightening the role of these factors in the HRQoL of patients after KT could bring a deeper understanding to the interpretation of post-KT HRQoL data. Therefore, we focused our research on the role of both stable personality traits (neuroticism and extroversion) and the current psychological status of patients (psychosocial distress).

Neuroticism expresses a person's reactivity and emotional stability, with high neuroticism meaning high emotional instability and low neuroticism meaning more emotional stability [15]. In the general population, neuroticism is a significant contributor to the number of symptoms typical for somatization, and this association is independent of distress or gender [13]. Also, according to Bolger *et al.* (1995), high neuroticism is associated with greater exposure and reactivity to stressful events [16]. Extroversion, on the other hand, expresses a person's level of arousal and stimulation-seeking [15]. In long-term research on the normal population, extroversion predisposed participants to experience objective life events more positively, in contrast to more negative experiences with neuroticism [17].

Psychological distress describes the actual psychological status of a patient – the current presence of anxiety and depressive symptoms – and is generally associated with chronic illnesses. Psychological distress is associated with the severity of a disease and its social impact on functional limitations rather than with a particular diagnosis [18,19].

The aim of this study was to explore the impact of neuroticism, extroversion and psychological distress individually on a patient's HRQoL when they are controlled mutually as well as for sociodemographic and medical variables.

Materials and methods

Sample

Of the initial 226 patients transplanted in the Kosice Transplantation Centre, 10 were excluded for not meeting the inclusion criteria: graft loss – $n = 5$ (2.2%); second KT – $n = 1$ (0.4%); exitus – $n = 3$ (1.3%); severe mental retardation – $n = 1$ (0.4%). From these remaining 216 patients fitting the inclusion criteria, 10 patients refused to participate in the study (4.4%), 25 patients did not return the questionnaires (11.1%) and four provided incomplete data (1.8%), resulting in a total of 177 patients (78.4%). There were no significant differences between respondents and nonrespondents with regard to age or gender. The local Ethics Committee approved the study.

Sociodemographic data

The sociodemographic variables age, gender, education and average income were obtained in a structured interview. Educational background was categorized into four groups: elementary, apprenticeship ('ref'), secondary and university education. Average income was first evaluated by dividing the household budget by the number of persons in the household and then categorized as follows: poor – lower than the minimum wage; bad – higher than the minimum wage but lower than 1.5 times the minimum wage ('ref'); average – from 1.5 times the minimum wage to two times the minimum wage; good – from 2 to 2.5 times the minimum wage; and very good – higher than 2.5 times the minimum wage.

For both education and average income, the largest groups – apprenticeship education and bad average income – were used as references.

Medical data

Information about medical variables was taken from patient medical records. The biochemical variables collected were glomerular filtration rate as measured by the Cockcroft-Gault equation [20] and serum albumin. Other medical variables included the time since transplantation (in months) and the presence of the following diseases: diabetes mellitus, blindness, amputation, osteoporosis, severe anaemia (less than 10 g/dl), coronary heart disease, stroke, active hepatitis B or C, gastric ulcer and other serious diseases. The sum of all co-morbid diseases was used for statistical analysis.

Health-related quality of life

Health-related quality of life was evaluated using the Short Form Health Survey (SF-36), which consists of eight sub-scales: physical functioning (PF), Role limitation attributable to physical problems (RP), Bodily pain (BP), Perception of general health (GH), Social functioning (SF), Vitality (VIT), Role limitation attributable to emotional problems (RE) and Mental health (MH). The first four subscales (PF, RP, BP, GH) are combined as the Physical summary component (PSC) and the other four subscales (SF, VIT, RE, MH) comprise the Mental summary component (MSC). In this study, only the summary component scores were used. Both summary components

are presented as scores between 0 and 100 where higher scores indicate better health status [21]. The validity and reliability of SF-36 have been tested in patients after KT [5,22]. In the present sample, all subscales and summary components reached satisfactory levels of Cronbach's α: PF – 0.91, RP – 0.84, BP – 0.85, GH – 0.8, SF – 0.73, VIT – 0.85, RE – 0.85, MH – 0.87, PSC – 0.91 and MSC – 0.73.

Personality and psychological well-being

Patients completed two questionnaires: the Eysenck Personality Questionnaire Revised-Abbreviated (EPQR-A) [15] and the General Health Questionnaire-12 (GHQ-12) [23]. The EPQR-A is a 24-item personality questionnaire consisting of four scales – Extroversion, Neuroticism, the Lie scale and Psychoticism. Each scale is represented by six questions with a dichotomous answer – yes or no – scored according to question by 0 or 1 point. The maximum score per scale is six, and a higher score indicates a higher presence of the particular personality trait. The score on the Extroversion subscale expresses the position of a person on a continuum from introversion to extroversion, by answering questions like: 'Are you a talkative person?' or 'Do you tend to keep in the background at social occasions?' The score on the Neuroticism subscale expresses the level of emotional instability by scoring positively on questions like: 'Does your mood often go up and down?' or 'Are you a worrier?' The Lie scale and Psychoticism subscales were excluded from the analysis because their reliability coefficients were not satisfactory [15]. In our sample Cronbach's α was 0.87 for the extraversion subscale and 0.78 for the neuroticism subscale.

The GHQ-12 questionnaire was developed as a screening instrument for detecting psychiatric disorders but currently is used to detect psychological distress or strain [23,24]. In 12 items, the person evaluates the extent of the presence of various experiences like: 'Facing up to problems', 'Feeling unhappy', 'Enjoying activities', 'Feeling worthless', etc. Responses range on a 4-point scale from 0 to 3 with the sum score ranging from 0 to 36. Higher scores indicate worse psychological well-being. In this analysis the total score was used. Cronbach's α for the entire questionnaire was 0.89 for our sample.

Statistics

The Mann–Whitney *U*-test and chi-squared test were used to examine the differences between respondents and non-respondents. A univariate general linear model (GLM) was performed to find predictors of perceived health status. In the primary analysis, the physical and MSC scores from the SF-36 were entered as the dependent variables for the whole sample. Gender, education and income were entered as fixed factors, and the largest group was always used as the reference group. Age, time from transplantation, GF, serum albumin, the number of co-morbid diseases, extroversion, neuroticism, social dysfunction and anxiety and depression were set as covariates. A model with no interactions between the independent variables was set. As it has been previously reported that personality traits might differentially affect the HRQoL of age and gender groups, secondary analyses for three age groups (younger than 40 years, $N = 41$; 40–55 years, $N = 84$; older than 55 years, $N = 52$) and gender were performed. In the secondary analysis, GLM was also performed for each of the SF-36 subscales. SPSS 16 (SPSS Inc., Chicago, IL, USA) was used for statistical analyses.

Results

The basic characteristics of the sample are presented in Table 1. There were no significant differences between respondents and those patients who did not provide complete data.

Physical HRQoL

The model consisting of sociodemographic, medical and psychological variables explained 52.9% of the total variance in perceived physical HRQoL. Young age ($P \leq 0.001$), average income ($P \leq 0.05$), a low number of co-morbid diseases ($P \leq 0.05$), low neuroticism ($P \leq 0.005$) and low psychological distress ($P \leq 0.001$) were found to be significantly associated with higher HRQoL. Patients with a good income perceived their physical status as significantly higher than patients with a bad income, and patients with a secondary education perceived their physical health as significantly higher than patients with an apprenticeship education (Table 2).

After splitting the sample into three groups, the results do slightly vary. The psychological variables are still significantly associated with the physical HRQoL, but in the youngest group only with neuroticism (B = 3.87**, F = 13.06**, R^2 = 40.7%), in the group 40–55 years with neuroticism (B = −3.61***, F = −13.65**, R^2 = 20.8%) and psychological distress (B = −1.02**, F = 12.34**, R^2 = 19.2%), and finally in the group over 55 years only with psychological distress (B = −1.02**, F = 9.58**, R^2 = 27.7%).

When comparing the results of the analysis in a sample split according to gender, the results are more interesting. In females, both neuroticism (B = −3.78*, F = 6.74*, R^2 = 15.4%) and psychological distress (B = −0.98**, F = 10.21**, R^2 = 21.6%) are significantly associated with physical HRQoL, while in males only psychological distress (B = −0.9**, F = 8.49**, R^2 = 10.3%) is associated.

Table 1. Characteristics of the sample.

Sociodemographic variables		
	N or range	% or AM ± SD
Gender		
Men	107	(60.5)
Women	70	(39.5)
Age	18–74	48.4 ± 12.1
Education		
Elementary	36	(20.3)
Apprenticeship ('ref')	81	(45.8)
Secondary	50	(28.2)
University	10	(5.7)
Income		
Poor	49	(27.7)
Bad ('ref')	78	(44.1)
Average	20	(11.3)
Good	17	(9.6)
Very good	13	(7.3)
Medical variables		
Time from KT (months)	3–86	26.8 ± 19.5
Number of co-morbid diseases	1–13	4.1 ± 2.1
Current albumin	30.2–51.5	43.8 ± 4
Glomerular filtration	0.2–1.8	1 ± 0.3
Organ donor		
Cadaveric	172	(97.2)
Living	5	(2.8)
Dialysis before KT		
Hemodialysis	130	(73.5)
Peritoneal dialysis	30	(16.9)
Both	17	(9.6)
Primary kidney disease		
Glomerulonephritis	78	(44.1)
tubulointerstitial nephritis	60	(33.9)
Polycystic kidneys	13	(7.3)
Diabetes mellitus	10	(5.6)
Congenital diseases	4	(2.3)
Systemic diseases	6	(3.4)
Other or unknown causes	6	(3.4)
Immunosuppresion protocol		
Pred + CsA + Aza	12	(6.8)
Pred + CsA	21	(11.9)
Pred + CsA + MMF	87	(49.1)
Pred + MMF + Tac	19	(10.7)
CsA + MMF	19	(10.7)
Tac + MMF	2	(1.1)
Tac	1	(0.6)
Aza + CsA	6	(3.4)
CsA	9	(5.1)
Tac + Sir + MMF + Pred	1	(0.6)
Personality and psychological well-being and self-perceived health		
Extroversion (EPQR-A)	0–6	2.4 ± 2.3
Neuroticism (EPQR-A)	0–6	1.5 ± 1.8
Psychological distress (GHQ-12)	0–36	11.7 ± 7.2
HRQoL-summary physical component (SF-36)	1.9–91.5	53.9 ± 18.5
HRQoL-summary mental component (SF-36)	1.8–98.2	61.1 ± 16.9

Pred, prednisone; CsA, cyclosporine A; Aza, azathioprine; MMF, mycophenolate mofetil; Tac, tacrolimus.

When analysing the SF-36 subscales, psychological distress was significantly negatively associated with all subscales comprising the PSC (PF: B = −0.74, F = 7.33, R^2 = 5.5%; Role limitation attributable to RP: B = −1.21, F = 4.55, R^2 = 3.5%; BP: B = −1.82, F = 19.31, R^2 = 13.3%; Perception of general health: B = −0.79, F = 9.06, R^2 = 6.7%). Neuroticism, on the other hand, was significantly negatively associated with PF (B = −2.42, F = 5.81, R^2 = 4.4%) and BP (B = −2.69, F = 6.32, R^2 = 4.8%), while no scale was significantly associated with extroversion.

To avoid underestimating the effect of neuroticism on HRQoL by adjusting neuroticism parameter estimates for GHQ-12 scores, we repeated the GLM for both summary scales without the GHQ-12 scores. In both physical and mental HRQoL the association estimates became slightly stronger; however the variance explained by the models as a whole decreases.

Mental HRQoL

The model consisting of sociodemographic, medical and psychological variables explained 67.2% of the total variance of mental HRQoL. Education ($P \leq 0.01$), socioeconomic status ($P \leq 0.05$), longer time from transplantation ($P \leq 0.05$), higher extroversion ($P \leq 0.05$), low neuroticism ($P \leq 0.001$) and low psychological distress ($P \leq 0.001$) were found to be significantly associated with higher HRQoL. Patients with an elementary education and a bad average income reported significantly lower mental HRQoL as compared with patients with an apprenticeship education and a good income, respectively (Table 3).

When the analysis was performed for the mental HRQoL in the group below 40 years of age, none of the factors was associated. In both other groups, the results were similar – in the group from 40–55 years neuroticism (B = −3.75***, F = 22.75***, R^2 = 30.4%) and psychological distress (B = −1.24***, F = 28.4***, R^2 = 35.3%) were associated, and in the group over 55 only psychological distress (B = −1.33***, F = 17.13***, R^2 = 40.7%) was significantly associated with mental HRQoL.

For female patients, only psychological distress (B = −1.25***, F = 24.19***, R^2 = 39.5%) was significantly associated with mental HRQoL, while in male patients, both neuroticism (B = −3.04***, F = 19.05***, R^2 = 20.5%) and psychological distress (B = −1.34***, F = 35.5***, R^2 = 32.4%) were significantly connected with mental HRQoL.

When analysing the SF-36 subscales, as with the subscales forming PSC, psychological distress was negatively associated with all SF-36 subscales making up the MSC (VIT: B = −1.2, F = 38.51, R^2 = 23.9%; SF: B = −1.41,

Table 2. General linear model: predictors of physical HRQoL.

				If GHQ 12 removed		
	B	F	% of explained variance	B	F	% of explained variance
Gender†	−4.3	2.9		−4.38	2.67	
Age	−0.5***	18.5***	10.3	−0.56***	20.35***	13.0
Education‡		3*	6.6		2.89*	6.4
Elementary	−2.4			−3.31		
Secondary	6.5*			6.39*		
University	7.2			7.23		
Average income§		2.7*	8		4.21**	11.7
Poor	−5.3			−6.62*		
Average	−1.1			−3.84		
Good	9.2*			12.12*		
Very good	2.8			−1.44		
Time from transplantation (months)	0.1	3		0.06	1.39	
Number of co-morbid diseases	−2	5.4*	4.2	−1.39	2.46	
Glomerular filtration	0.1	0.0		0.92	0.05	
Serum albumin	0.3	1.3		0.52	2.76	
Extroversion (EPQR-A)	0.5	0.9		0.82	2.02	
Neuroticism (EPQR-A)	−2**	6.9**	5.2	−3.44***	23.24***	15.5
Psychological distress (GHQ-12)	−0.9***	19.2***	13.2			
Total model (adjusted R square)			52.9			46.1

*$P \leq 0.05$, **$P \leq 0.005$, ***$P \leq 0.001$.

†Reference category for gender – men; ‡Reference category for education – apprenticeship; §Reference category for average income – poor.

Table 3. General linear model: Predictors of mental HRQoL.

				If GHQ 12 removed		
	B	F	% of explained variance	B	F	% of explained variance
Gender†	1.9	1		1.72	0.54	
Age	−0.1	2.6.		−0.22*	4.28*	3.3
Education‡		4.7**	10.2		4.02*	
Elementary	−6.5*			−7.791*		8.7
Secondary	3.5			3.32		
University	−1.8			−1.11		
Average income§		2.8*	8.2		4.76**	
Poor	−3.3			−5.16*		13
Average	−0.4			−4.22		
Good	8.1*			12.35**		
Very good	−1.8			0.08		
Time from transplantation (months)	0.1	4.5*	3.4	0.05	1.02	
Number of co-morbid diseases	−1.1	2.9		−0.27	0.12	
Glomerular filtration	4.6	2.6		5.7	2.69	
Serum albumin	0.2	0.5		0.41	2.22	
Extroversion (EPQR-A)	1*	5.8*	4.4	1.45**	8.12**	6
Neuroticism (EPQR-A)	−3.2***	30.8***	19.6	−5.25***	70.24***	35.6
Psychological distress (GHQ-12)	−1.3***	66.7***	34.6			
Total model (adjusted R square)			67.2			50.2

*$P \leq 0.05$, **$P \leq 0.005$, ***$P \leq 0.001$.

†Reference category for gender – men; ‡Reference category for education – apprenticeship; §Reference category for average income – poor.

F = 22.81, R^2 = 15.3%; Role limitation attributable to emotional problems: B = −1.42, F = 6.18, R^2 = 4.7%; MH: B = −1.26, F = 51.76, R^2 = 29.1%). Neuroticism was significantly negatively associated with Role limitation attributable to emotional problems (B = −6.33, F = 9.19, R^2 = 6.8), MH (B = −3.56, F = 30.89, R^2 = 19.7) and VT

(B = −2.68, F = 16.34, R^2 = 10.4%), which was also found to have an inverse, positive association with extroversion (B = 1.27, F = 6.21, R^2 = 4.7%).

To avoid underestimating the effect of neuroticism on HRQoL by adjusting neuroticism parameter estimates for GHQ-12 scores, we repeated the GLM for both summary scales without the GHQ-12 scores. In both physical and mental HRQoL, the association estimates became slightly stronger; however, the variance explained by the whole models decreases.

Subsequently, we decided to test the GLM in population of patients with neuroticism scores higher than 4 (N = 27), and similarly, we did not find any association between extroversion and the SF-36 subscales or summary scores. However, we are aware of the limited generalization of this analysis resulting from the small size of the sample.

Similarly, we were interested in the associations of psychological distress to HRQoL in the high neuroticism group. In the population with a neuroticism score higher than 4, GHQ-12 was significantly associated with QOL (B = −1.78; F = 0.00; $P \leq 0.05$).

Discussion

The aim of this study was to explore psychological variables for predicting HRQoL in kidney transplant recipients. Our results suggest that personality traits, especially neuroticism and psychosocial distress, are significantly associated with HRQoL, even when the analysis is controlled for relevant sociodemographic and medical variables.

Sociodemographic variables

Similar to the findings in previous studies, we found that younger patients perceive their physical health as better [5,18,25,26]. No association between age and mental HRQoL was observed in our sample. In correspondence with previous findings, both physical and MH status are associated with background education and average income: the higher the education and the income, the better the evaluation of physical and MH [27,28].

Medical variables

In agreement with the literature [5,7,29], we found that higher perceived physical HRQoL is associated with a low number of co-morbid diseases. On the other hand, higher mental HRQoL was associated only with longer time from transplantation. As we used a cross-sectional model in this study, it is not possible to sufficiently explain the role of time. We speculate that longer time after transplantation is connected with good functioning of the graft over time and with better adjustment to a new lifestyle, and this could lead to improved MH. In spite of the stressed inevitability of studying the relation between nutrition, kidney function and HRQoL [7,30,31], the level of albumin and the glomerular function were not significant predictors in any model.

Psychological variables

In our sample both personality traits (neuroticism, extroversion) and psychological well-being were strongly associated with perceived health status. The relationship between negative affect and health or symptom reporting was described in various theories, like joint impact hypothesis, symptom perception hypothesis or disability hypothesis. The joint impact hypothesis and symptom perception hypothesis suggest a necessary effect of self-focus in fostering the experience of somatic symptoms [10,11]. In our sample, introversion, which is to a certain extent associated with self-focus, was, together with higher distress, associated with lower mental HRQoL, but not with physical HRQoL. The disability hypothesis, on the other hand, proposes that physical illness and disability lead to an increase in both negative affect and physical symptom reporting, and thus sicker people experience more negative affect resulting from increasing disability and also report more physical symptoms because of the advanced disease state. Measured physical health objectives in our sample were glomerular function, time from KT and the number of co-morbid diseases. Surprisingly, none of them was associated with physical or mental HRQoL. On the other hand, to test such a hypothesis a slightly different study design would be needed.

Neuroticism

According to our findings and to the findings of Brickman *et al.* (1998) that higher pretransplant neuroticism predicts more post-transplant side-effects [32], we could conclude that the inverse relation between HRQoL and neuroticism in our population might be explained by the fact that patients with higher neuroticism complain more about health issues and therefore also report lower HRQoL. In a study by Goodwin *et al.* (2006), after adjusting for differences in demographic characteristics and co-morbid mental disorders, neuroticism was associated with increased odds for kidney disease in the population of adults in the community [33]. On the other hand, studies by Christensen (2002) and Goodwin *et al.* (2006) hint at an alternative explanation. Christensen *et al.* (2002), in their 4-year prospective study into patients with chronic renal insufficiency, found that the estimated

mortality rate in patients with relatively high neuroticism scores was 37.5% higher than the rate for patients with average scores [34]. These findings suggest that the relation between neuroticism and HRQoL is probably more complicated. Even if it is assumed that personality traits persist without big changes over time, it is possible that there is a bidirectional effect between neuroticism on the one hand and disease development on the other, symptom severity and perceived health on the other. One example of this effect is study of Iwuagwu (2006), who found significant increase in both emotional stability and extroversion in patients after bilateral breast reduction in comparison to both baseline values and a control group [35].

Extroversion

Extroversion was in our sample significantly associated with HRQoL and with the subscale VT. In the current literature, there is a dearth of studies dealing with the relation between extroversion and HRQoL in chronic disease in general. An exception is a study by Elmstahl (1996), who found that extrovert personality predicts greater improvement in activities for daily living and also functional outcome after stroke and was also correlated with active coping mechanisms [9]. Our explanation of the positive predictive effect of extroversion on perceived MH is based on a similar idea – extroversion is proven to be associated with an active coping mechanism. Unfortunately, in our study, we did not measure any coping mechanism, so we cannot confirm this hypothesis. Another explanation is offered by the previously mentioned joint impact hypothesis and symptom perception hypothesis. People with higher extroversion prefer more stimulation from outside and thus self-focus is necessary for both symptom-reporting and increased negative affect.

Psychological distress

Psychological distress was found to be a strong predictor of both physical and mental HRQoL, even when controlled for sociodemographic, medical and relevant psychological variables. Patients who have anxious and depressive symptoms describe their quality of life as worse. This finding supports previous findings stressing the impact of depression and anxiety on HRQoL evaluation [25,36]. According to some authors, the levels of anxiety do not diminish after KT, because the anxiety generated by dialysis is replaced with graft-loss anxiety, anxiety related to adjustment to life after KT and to treatment effects [37]. However, changes in psychosocial distress in patients before and after KT are not as well documented as changes in HRQoL; its presence in patients after KT [4] and its impact on their HRQoL is obvious. High psychological distress is a predictor of low long-term quality of life in transplant patients [25] and significantly contributes to the total somatic symptom count [13]. What remains unclear is whether more distressed patients report poorer HRQoL in general, or if more distressed patients are also more vulnerable, and which other variables interfere in this relation. For instance Christensen (2002) attributes changes in emotional well-being to a patient's coping preferences [38]. Similarly, as with neuroticism, this relations needs to be examined in detail in future research by, for example, designing a study to test one of the previously mentioned hypothesis, like the joint impact hypothesis.

Strengths and limitations of the study

This study has some weaknesses, mostly attributable to the methods we used. First of all, the cross-sectional design did not allow us to obtain a deeper interpretation of the impact of psychological variables on HRQoL. Second, the data used in this study was collected from one center only, so generalization of the results has to be done carefully and with regard to the characteristics of our sample, although it did consist of all the patients from one-fifth of the country's inhabitants. Finally, we used a simple count of co-morbid diseases instead of a standardized co-morbidity index in the final analysis. We used the Davies index [39] to assess co-morbidity first, but no differences between the low, middle and high co-morbidity groups were found. In our sample the Davies index appeared to be insufficiently sensitive. Therefore, we decided to repeat the analysis, and instead of the Davies index, we used the number of co-morbidity diseases, which was shown to be significant predictor of physical HRQoL. On the other hand, the greatest benefit of this study is that it combines sociodemographic, medical and psychological variables into one analysis and thus deals with their potential confounding. Our results show the importance of often neglected psychological variables in the process of evaluation and prediction of HRQoL in kidney transplant recipients.

Practice implications

The practical implications from our results could mainly be used in interpreting HRQoL after KT and in suggesting interventions focused on improving quality of life. It seems likely that along with medical interventions, psychotherapeutic intervention programs focused on decreasing distress can lead to increased HRQoL in patients after KT, even in those with high neuroticism. Nevertheless, this needs to be verified in further research based on a

longitudinal study with a control sample focused also on their association with compliance. Similarly, to reach a detailed view on the role of psychological variables, especially on their influence on HRQoL in kidney transplant recipients, further research should be longitudinal design and also should include other variables, e.g. functional status and rejection episodes.

Authorship

LP: performed study, collected and analysed data, wrote the paper. IN: designed the study. JR: designed the study, performed the study. RR, JPvD, and JWG: designed and supervised the study.

Acknowledgements

This work was supported by the Slovak Research and Development Agency under contract No APVV- 20-038305.

References

1. Laupacis A, Keown P, Pus N, *et al.* A study of the quality of life and cost-utility of renal transplantation. *Kidney Int* 1996; **50**: 235.
2. Wolfe RA, Ashby VB, Milford EL, *et al.* Comparison of mortality in all patients on dialysis, patients on dialysis awaiting transplantation, and recipients of a first cadaveric transplant. *New Engl J Med* 1999; **341**: 1725.
3. Burra P, De Bona M. Quality of life following organ transplantation. *Transpl Int* 2007; **20**: 397.
4. Muehrer RJ, Becker BN. Life after transplantation: new transitions in quality of life and psychological distress. *Semin Dialysis* 2005; **18**: 124.
5. Wight JP, Edwards L, Brazier J, *et al.* The SF36 as an outcome measure of services for end stage renal failure. *Qual Health Care* 1998; **7**: 209.
6. Dew MA, Switzer GE, Goycoolea JM, *et al.* Does transplantation produce quality of life benefits? A quantitative analysis of the literature *Transplantation* 1997; **64**: 1261.
7. Rebollo P, Ortega F, Baltar JM, *et al.* Health related quality of life (HRQOL) of kidney transplanted patients: variables that influence it. *Clin Transplant* 2000; **14**: 199.
8. Courneya KS, Bobick TM, Rhodes RE, *et al.* Personality correlates of patients' subjective well-being after surgery for colorectal cancer: an application of the five-factor model. *J Psychosoc Oncol* 2000; **18**: 61.
9. Elmstahl S, Sommer M, Hagberg B. A 3-year follow-up of stroke patients: relationships between activities of daily living and personality characteristics. *Arch Gerontol Geriat* 1996; **22**: 233.
10. Gendolla GHE, Abele AE, Andrei A, Spurk D, Richter M. Negative mood, self-focused attention, and the experience of physical symptoms: the joint impact hypothesis. *Emotion* 2005; **5**: 131.
11. Griffin KW, Friend R, Kaell AT, Bennett RS, Wadhwa NK. Negative affect and physical symptom reporting: a test of explanatory models in two chronically ill populations. *Psychol Health* 1999; **14**: 295.
12. Kempen GIJM, van Heuvelen MJG, van Sonderen E, *et al.* The relationship of functional limitations to disability and the moderating effects of psychological attributes in community-dwelling older persons. *Soc Sci Med* 1999; **48**: 1161.
13. Rosmalen JGM, Neeleman J, Gans ROB, de Jonge P. The association between neuroticism and self-reported common somatic symptoms in a population cohort. *J Psychosom Res* 2007; **62**: 305.
14. van Straten A, Cuijpers P, van Zuuren FJ, Smits N, Donker M. Personality traits and health-related quality of life in patients with mood and anxiety disorders. *Qual Life Res* 2007; **16**: 1.
15. Sato T. The Eysenck personality questionnaire brief version: factor structure and reliability. *J Psychol* 2005; **139**: 545.
16. Bolger N, Zuckerman A. A framework for studying personality in the stress process. *J Pers Soc Psychol* 1995; **69**: 890.
17. Magnus K, Diener E, Fujita F, Pavot W. Extroversion and neuroticism as predictors of objective life events – a longitudinal analysis. *J Pers Soc Psychol* 1993; **65**: 1046.
18. Cassileth BR, Lusk EJ, Strouse TB, *et al.* Psychosocial status in chronic illness – a comparative-analysis of 6 diagnostic groups. *New Engl J Med* 1984; **311**: 506.
19. Verhaak PFM, Heijmans MJWM, Peters L, Rijken M. Chronic disease and mental disorder. *Soc Sci Med* 2005; **60**: 789.
20. Cockcroft DW, Gault MH. Prediction of creatinine clearance from serum creatinine. *Nephron* 1976; **16**: 31.
21. Ware JE, Sherbourne CD. The Mos 36-item short-form health survey (Sf-36) .1. Conceptual-framework and item selection. *Med Care* 1992; **30**: 473.
22. Gomez-Besteiro MI, Santiago-Perez MI, onso-Hernandez A, Valdes-Canedo F, Rebollo-Alvarez P. Validity and reliability of the SF-36 questionnaire in patients on the waiting list for a kidney transplant and transplant patients. *Am J Nephron* 2004; **24**: 346.
23. Goldberg DP, Gater R, Sartorius N, *et al.* The validity of two versions of the GHQ in the WHO study of mental illness in general health care. *Psychol Med* 1997; **27**: 191.
24. Goldberg DP, Hillier VF. Scaled version of the general health questionnaire. *Psychol Med* 1979; **9**: 139.
25. Franke GH, Reimer J, Philipp T, Heemann U. Aspects of quality of life through end-stage renal disease. *Qual Life Res* 2003; **12**: 103.
26. Rosenberger J, van Dijk JP, Nagyova I, *et al.* Do dialysis- and transplantation-related medical factors affect perceived health status? *Nephrol Dial Transpl* 2005; **20**: 2153.

27. Rosenberger J, van Dijk JP, Nagyova I, *et al.* Predictors of perceived health status in patients after kidney transplantation. *Transplantation* 2006; **81**: 1306.
28. Sesso R, Rodrigues-Neto JF, Ferraz MB. Impact of socioeconomic status on the quality of life of ESRD patients. *Am J Kidney Dis* 2003; **41**: 186.
29. Cameron JI, Whiteside C, Katz J, Devins GM. Differences in quality of life across renal replacement therapies: a meta-analytic comparison. *Am J Kidney Dis* 2000; **35**: 629.
30. Tsuji-Hayashi Y, Fitts SS, Takai I, *et al.* Health-related quality of life among dialysis patients in Seattle and Aichi. *Am J Kidney Dis* 2001; **37**: 987.
31. Valderrabano F. Quality of life benefits of early anaemia treatment. *Nephrol Dial Transpl* 2000; **15**: 23.
32. Brickman AL, Rothberg ST, Yount SE, Blaney NT, Morgan R. Is satisfaction with kidney transplantation influenced by personality and posttransplant side effects? *Dial Transplant* 1998; **27**: 725.
33. Goodwin RD, Cox BJ, Clara I. Neuroticism and physical disorders among adults in the community: results from the national comorbidity survey. *J Behav Med* 2006; **29**: 229.
34. Christensen AJ, Ehlers SL, Wiebe JS, *et al.* Patient personality and mortality: a 4-year prospective examination of chronic renal insufficiency. *Health Psychol* 2002; **21**: 315.
35. Iwuagwu OC, Walker LG, Stanley PW, *et al.* Randomized clinical trial examining psychosocial and quality of life benefits of bilateral breast reduction surgery. *Brit J Surg* 2006; **93**: 291.
36. Fan PL, Shu CH, Shiang JC, Kuo TS, Lung FW. Hypertension – a possible vulnerability marker for depression in patients with end-stage renal disease. *Nephron Clin Pract* 2006; **102**: C43.
37. Engle D. Psychosocial aspects of the organ transplant experience: what has been established and what we need for the future. *J Clin Psychol* 2001; **57**: 521.
38. Christensen AJ, Ehlers SL. Psychological factors in end-stage renal disease: an emerging context for behavioral medicine research. *J Consult Clin Psych* 2002; **70**: 712.
39. Davies SJ, Phillips L, Naish PF, Russell GI. Quantifying comorbidity in peritoneal dialysis patients and its relationship to other predictors of survival. *Nephrol Dial Transpl* 2002; **17**: 1085.

